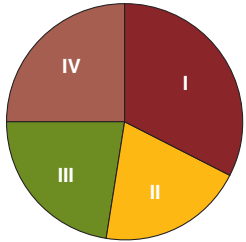


Computerized Pre-Professional Skills Test: Mathematics (5730)

Test at a Glance

Test Name	Computerized Pre-Professional Skills Test: Mathematics		
Test Code	5730		
Time	75 minutes		
Number of Questions	46		
Format	Multiple-choice questions (Calculators prohibited)		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Number and Operations	15	32.5%
	II. Algebra	9	20%
	III. Geometry and Measurement	10	22.5%
	IV. Data Analysis and Probability	12	25%

About This Test

The Computerized Pre-Professional Skills Test in Mathematics measures those mathematical skills and concepts that an educated adult might need. It focuses on the key concepts of mathematics and on the ability to solve problems and to reason in a quantitative context. Many of the problems require the integration of multiple skills to achieve a solution.

The test questions are from four content categories: number and operations, algebra, geometry and measurement, and data analysis and probability.

Computation is held to a minimum, and few technical words are used. Terms such as area, perimeter, ratio, integer, factor, and prime number are used because it is assumed that these are commonly encountered in the mathematics all examinees have studied. Figures are drawn as accurately as possible and lie in a plane unless otherwise noted.

This test may contain some questions that will not count toward your score.

Topics Covered

Representative descriptions of topics covered in each category are provided below.

I. Number and Operations

- Order
 - Demonstrate an understanding of order among integers, fractions, and decimals
- Equivalence
 - Demonstrate an understanding that a number can be represented in more than one way
- Numeration and Place Value
 - Demonstrate an understanding of place value, how numbers are named, and order of magnitude of numbers
- Number Properties
 - Demonstrate an understanding of the properties of whole numbers without necessarily knowing the names of the properties
- Operation Properties
 - Demonstrate an understanding of the properties—commutative, associative, and distributive—of the basic operations of addition, subtraction, multiplication, and division
 - Recognize equivalent computational procedures
- Computation
 - Perform computations
 - Adjust the result of a computation to fit the context of a problem
 - Identify numbers or information or operations needed to solve a problem
- Estimation
 - Estimate the result of a calculation
 - Determine the reasonableness of an estimate
- Ratio, Proportion, and Percent
 - Solve problems involving ratio, proportion, and percent
- Numerical Reasoning
 - Logical connectives and quantifiers: interpret statements that use logical connectives (and, if-then) as well as quantifiers (some, all, none)
 - Validity of arguments: use deductive reasoning to determine whether an argument (a series of statements leading to a conclusion) is valid or invalid
 - Generalization: identify an appropriate generalization, an example that disproves an inappropriate generalization, or a hidden assumption

II. Algebra

- Equations and Inequalities
 - Solve simple equations and inequalities
 - Predict the outcome of changing some number or condition in a problem
- Algorithmic Thinking
 - Demonstrate an understanding of the algorithmic point of view; that is, follow a given procedure or flowchart
 - Recognize various ways to solve a problem
 - Identify, complete, or analyze a procedure
- Patterns
 - Discover patterns in a procedure
 - Identify and recognize patterns in data
 - Demonstrate an understanding of direct, inverse, and other kinds of variation without necessarily knowing the correct term for the relationship
- Algebraic Representations
 - Explore relationships between verbal or symbolic expressions and graphs
 - Use symbolic algebra to represent situations and to solve problems
- Algebraic Reasoning
 - Logical connectives and quantifiers: interpret statements that use logical connectives (and, if-then) as well as quantifiers (some, all, none)
 - Validity of arguments: use deductive reasoning to determine whether an argument (a series of statements leading to a conclusion) is valid or invalid
 - Generalization: identify an appropriate generalization, an example that disproves an inappropriate generalization, or a hidden assumption

III. Geometry and Measurement

Geometry

- Geometric Properties
 - Understand and apply the characteristics and properties of two-dimensional geometric shapes
 - Use geometric relationships such as the Pythagorean relationship, congruence, and similarity
 - Apply transformations or use symmetry to analyze mathematical situations

- The xy-Coordinate Plane
 - Use coordinate geometry to represent geometric concepts
- Geometric Reasoning
 - Logical connectives and quantifiers: interpret statements that use logical connectives (and, if-then) as well as quantifiers (some, all, none)
 - Validity of arguments: use deductive reasoning to determine whether an argument (a series of statements leading to a conclusion) is valid or invalid
 - Generalization: identify an appropriate generalization, an example that disproves an inappropriate generalization, or a hidden assumption

Measurement

- Systems of Measurement
 - Demonstrate basic literacy in both the U.S. customary and metric systems of measurement
 - Convert from one unit to another within the same system
 - Recognize and use appropriate units of measure
 - Read a graduated scale
- Measurement
 - Determine the measurements needed to solve a problem
 - Recognize and use geometric concepts in making linear, area, and volume measurements
 - Solve measurement problems by using a formula, estimating, employing indirect measurement, using rates as measures, making visual comparisons, using scaling or proportional reasoning, or using a nonstandard unit

IV. Data Analysis and Probability

- Data Interpretation
 - Read and interpret visual displays of quantitative information, such as bar graphs, line graphs, pie charts, pictographs, tables, stem-and-leaf plots, scatterplots, schedules, and Venn and other diagrams
- Data Representation
 - Understand the correspondence between data sets and their graphic representations
- Trends and Inferences
 - Make observations, comparisons, and predictions or extrapolations from a given data display
 - Draw conclusions or make inferences from a given data display
- Measures of Center and Spread
 - Determine mean, median, mode(s), and range
- Probability
 - Interpret numbers used to express simple probability
 - Assign a probability to a possible outcome

Sample Test Questions

The sample questions that follow illustrate the types of questions in the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then click on the oval to the left of your choice.

Remember, try to answer every question.

Special Note: Figures that accompany problems in this test are intended to provide information useful in solving the problem. The figures are drawn as accurately as possible except when it is stated in a specific problem that its figure is not drawn to scale. Figures can be assumed to lie in a plane unless otherwise indicated. Position of points can be assumed to be in the order shown, and lines shown as straight can be assumed to be straight. The symbol \square denotes a right angle.

1. On the computer screen you will see the following:

Click on the oval next to your choice.

Which of the following is equal to a quarter of a million?

☐ 40,000 ☐ 250,000 ☐ 2,500,000
☐ $\frac{1}{4,000,000}$ ☐ $\frac{4}{1,000,000}$

Click on your choice.

Since one million is 1,000,000, a quarter of a million is $\frac{1}{4} \times 1,000,000$, or 250,000.

The answer is indicated by the shaded oval.

Which of the following is equal to a quarter of a million?

☐ 40,000 ☒ 250,000 ☐ 2,500,000
☐ $\frac{1}{4,000,000}$ ☐ $\frac{4}{1,000,000}$

Click on your choice.

2. On the computer screen you will see the following:

Click on the oval next to your choice.

Which of the following fractions is least?

☐ $\frac{11}{10}$
☐ $\frac{99}{100}$
☐ $\frac{25}{24}$

☐ $\frac{3}{2}$
☐ $\frac{501}{500}$

Click on your choice.

Of the five fractions given, four are greater than 1; that is, the numerators are greater than the denominators. Only one of the fractions, $\frac{99}{100}$, is less than 1, so it must be the least.

The answer is indicated by the shaded oval.

Which of the following fractions is least?

☐ $\frac{11}{10}$
☒ $\frac{99}{100}$
☐ $\frac{25}{24}$

☐ $\frac{3}{2}$
☐ $\frac{501}{500}$

Click on your choice.

3. On the computer screen you will see the following:

Click on the oval next to your choice.

Which of the following sales commissions is greatest?

☐ 1% of \$1,000
☐ 10% of \$200
☐ 12.5% of \$100
☐ 15% of \$100
☐ 25% of \$40

Click on your choice.

The five sales commissions are as follows:

1st choice: 1% of \$1,000 is \$10.

2nd choice: 10% of \$200 is \$20.

3rd choice: 12.5% of \$100 is \$12.50.

4th choice: 15% of \$100 is \$15.

5th choice: 25% of \$40 is \$10.

Note that you do not need to compute all five sales commissions. You can rule out certain choices by comparing them to the other similar choices. For example, consider the 3rd and 4th choices. Since $15 > 12.5$, then 15% of \$100 (4th choice) is greater than 12.5% of \$100 (3rd choice), so the 3rd choice cannot be the correct answer.

Which of the following sales commissions is greatest?

☐ 1% of \$1,000
☒ 10% of \$200
☐ 12.5% of \$100
☐ 15% of \$100
☐ 25% of \$40

Click on your choice.

The answer is indicated by the shaded oval.

4. On the computer screen you will see the following:

Click on the oval next to your choice.

Men	12
Women	18
Boys	10
Girls	8

The table above shows the distribution of men, women, boys, and girls in a group of 48 individuals. If one individual is to be randomly selected from the group, what is the probability that the individual selected will be a woman?

☐ $\frac{1}{18}$ ☐ $\frac{2}{15}$ ☐ $\frac{1}{4}$ ☐ $\frac{3}{8}$ ☐ $\frac{1}{2}$

Click on your choice.

Since there are 48 individuals in the group and you are given in the table that 18 are women, the probability of a woman being selected is 18 out of 48, or $\frac{18}{48} = \frac{3}{8}$.

The answer is indicated by the shaded oval.

Men	12
Women	18
Boys	10
Girls	8

The table above shows the distribution of men, women, boys, and girls in a group of 48 individuals. If one individual is to be randomly selected from the group, what is the probability that the individual selected will be a woman?

☐ $\frac{1}{18}$ ☐ $\frac{2}{15}$ ☐ $\frac{1}{4}$ ☒ $\frac{3}{8}$ ☐ $\frac{1}{2}$

Click on your choice.

5. On the computer screen you will see the following:

Click on the oval next to your choice.

If $P \div 5 = Q$, then $P \div 10 =$

☐ $10Q$
☐ $2Q$
☐ $Q \div 2$
☐ $Q \div 10$
☐ $Q \div 20$

Click on your choice.

There are several ways to solve this problem.

One way is to express $P \div 5 = Q$ as $\frac{P}{5} = Q$.

Then $P = 5Q$, and so $\frac{P}{10} = \frac{5Q}{10} = \frac{Q}{2}$, or

$P \div 10 = Q \div 2$.

Alternatively, $\frac{P}{5} = Q$ is equivalent to $\frac{1}{2} \left(\frac{P}{5} \right) = \frac{1}{2} Q$;

hence $\frac{P}{10} = \frac{Q}{2}$.

Another way is to divide a few numbers, such as 30 or 100, by both 5 and 10 and compare results. All of these examples illustrate the fact that if $P \div 5 = Q$, then $P \div 10$ must be $\frac{Q}{2}$, or $Q \div 2$.

The answer is indicated by the shaded oval.

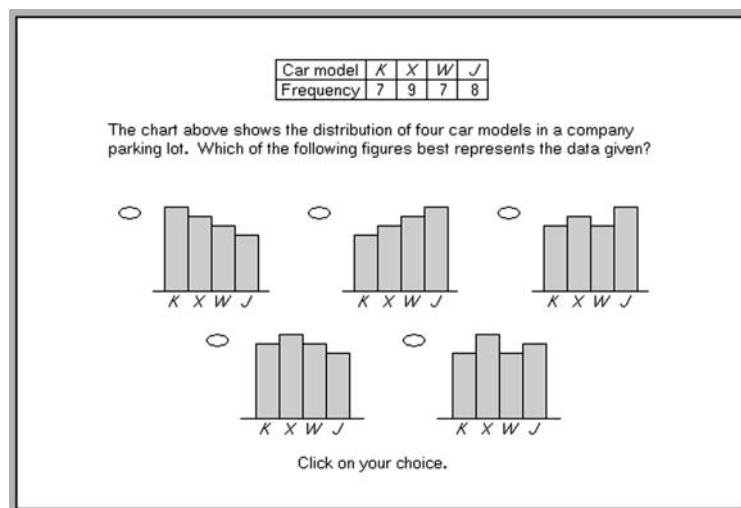
If $P \div 5 = Q$, then $P \div 10 =$

☐ $10Q$
☐ $2Q$
☒ $Q \div 2$
☐ $Q \div 10$
☐ $Q \div 20$

Click on your choice.

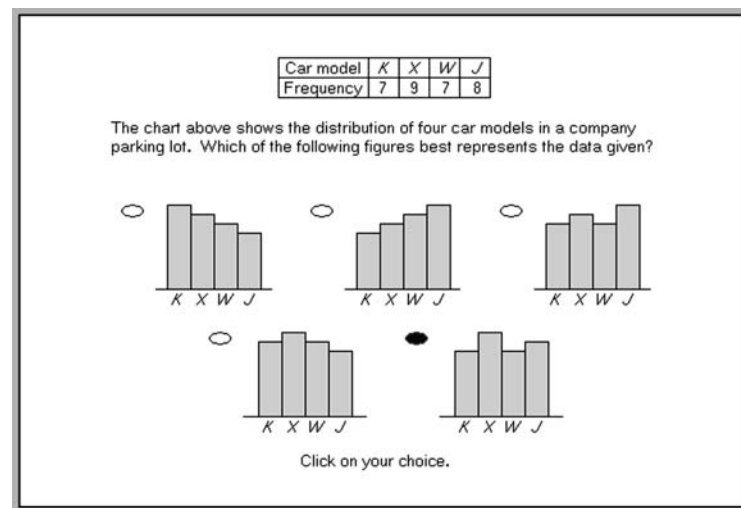
6. On the computer screen you will see the following:

Click on the oval next to your choice.



The chart shows that one frequency is greater than the others and two frequencies are equal. A quick look at the choices shows that only the rightmost graph in the top row and the two graphs in the bottom row have both one bar that is taller than the others and two bars of equal height. According to the chart, the frequency of model X is greatest, which eliminates the rightmost graph in the top row. Only the rightmost graph in the bottom row shows that the relative heights of all the bars agree with the information in the chart; that is, J is less than X but greater than K and W.

The answer is indicated by the shaded oval.



7. On the computer screen you will see the following:

Click on the oval next to your choice.

x	y
0	5
2	11
6	23
7	26
10	35

Which of the following equations expresses the relationship between x and y in the table above?

☐ $y = x + 5$
☐ $y = x + 6$
☐ $y = 3x + 5$
☐ $y = 4x - 1$
☐ $y = 4x - 5$

Click on your choice.

The correct equation must hold when each of the pairs of values from the table is substituted for x and y . The equation $y = x + 5$ (1st choice) holds for $x = 0$, $y = 5$, but not for $x = 2$, $y = 11$. The equations $y = x + 6$, $y = 4x - 1$, and $y = 4x - 5$ (2nd, 4th, and 5th choices) do not hold for $x = 0$, $y = 5$. The equation $y = 3x + 5$ (3rd choice) holds for all of the values given:

if $x = 0$, then $y = 3(0) + 5 = 5$,
 if $x = 2$, then $y = 3(2) + 5 = 11$,
 if $x = 6$, then $y = 3(6) + 5 = 23$, and so forth.

The answer is indicated by the shaded oval.

x	y
0	5
2	11
6	23
7	26
10	35

Which of the following equations expresses the relationship between x and y in the table above?

☐ $y = x + 5$
☐ $y = x + 6$
☒ $y = 3x + 5$
☐ $y = 4x - 1$
☐ $y = 4x - 5$

Click on your choice.

8. On the computer screen you will see the following:

Click on the oval next to your choice.

WINDCHILL INDEX IN °F						
	Wind Speed (mph)					
	10	15	20	25	30	
15°	3	0	-2	-4	-5	
10°	-4	-7	-9	-11	-12	
5°	-10	-13	-15	-17	-19	
0°	-16	-19	-22	-24	-26	
-5°	-22	-26	-29	-31	-33	
-10°	-28	-32	-35	-37	-39	
-15°	-35	-39	-42	-44	-46	

The temperature today is -10°F but the windchill index is the same as it was last week when the temperature was -15°F and the wind speed was 15 miles per hour. According to the chart above, what is the wind speed today?

- ☐ 10 mph ☐ 15 mph ☐ 20 mph
☐ 25 mph ☐ 30 mph

Click on your choice.

The problem says that last week the temperature was -15°F and the wind speed was 15 miles per hour. According to the chart, that corresponds to a windchill index of -39°F . The problem says that the temperature today is -10°F and the windchill index is the same as it was last week, -39°F . Another look at the chart will indicate that, in the row for -10°F , a windchill index of -39°F is in the column that corresponds to a wind speed of 30 miles per hour.

The answer is indicated by the shaded oval.

WINDCHILL INDEX IN °F						
	Wind Speed (mph)					
	10	15	20	25	30	
15°	3	0	-2	-4	-5	
10°	-4	-7	-9	-11	-12	
5°	-10	-13	-15	-17	-19	
0°	-16	-19	-22	-24	-26	
-5°	-22	-26	-29	-31	-33	
-10°	-28	-32	-35	-37	-39	
-15°	-35	-39	-42	-44	-46	

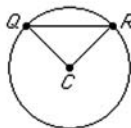
The temperature today is -10°F but the windchill index is the same as it was last week when the temperature was -15°F and the wind speed was 15 miles per hour. According to the chart above, what is the wind speed today?

- ☐ 10 mph ☐ 15 mph ☐ 20 mph
☐ 25 mph ☒ 30 mph

Click on your choice.

9. On the computer screen you will see the following:

Click on the oval next to your choice.



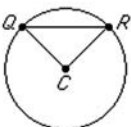
In the figure above, C is the center of the circle. Which of the following must be true?

- ☐ QC and RC have the same length.
- ☐ QR and RC have the same length.
- ☐ QC is perpendicular to QR .
- ☐ QR is perpendicular to RC .
- ☐ $\triangle QRC$ is equilateral.

Click on your choice.

Since C is the center of the circle, QC and RC are both radii of the circle and therefore have the same length.

The answer is indicated by the shaded oval.



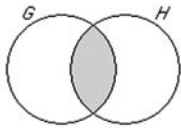
In the figure above, C is the center of the circle. Which of the following must be true?

- ☒ QC and RC have the same length.
- ☐ QR and RC have the same length.
- ☐ QC is perpendicular to QR .
- ☐ QR is perpendicular to RC .
- ☐ $\triangle QRC$ is equilateral.

Click on your choice.

10. On the computer screen you will see the following:

Click on the oval next to your choice.



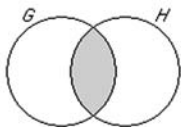
In the Venn diagram above, circle G represents the integers 2 to 10, inclusive, and circle H represents the integers 6 to 12, inclusive. How many integers are represented by the shaded region?

- ☐ Two
- ☐ Three
- ☐ Four
- ☐ Five
- ☐ Six

Click on your choice.

In the Venn diagram, the shaded region represents the integers that are in both G and H ; that is, the integers that are among the integers 2 through 10 and also among the integers 6 through 12, or 6, 7, 8, 9, and 10, which amount to five integers.

The answer is indicated by the shaded oval.



In the Venn diagram above, circle G represents the integers 2 to 10, inclusive, and circle H represents the integers 6 to 12, inclusive. How many integers are represented by the shaded region?

- ☐ Two
- ☐ Three
- ☐ Four
- ☒ Five
- ☐ Six

Click on your choice.



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